April 26, 2019

Comments Regarding Ethylene Oxide (EtO)
On the National Emission Standards for Hazardous Air Pollutants:
Hydrochloric Acid Production Residual Risk and Technology Review.
Docket ID EPA–HQ–OAR–2018–0417

We are scientists, medical professionals, and environmental health experts. We have devoted our careers to identifying preventable causes of human diseases and deaths. We write to support the findings and conclusions of the EPA Integrated Risk Information System (IRIS) chemical assessments, for use in regulatory determinations.

In particular, we support EPA's use of the risk estimates as described in the IRIS Evaluation of the Inhalation Carcinogenicity of Ethylene Oxide (EtO) (IRIS, Dec 2016).[1] The IRIS EtO assessment has been reviewed by agency and non-agency experts, and subjected to public comment including from the chemical industry.[2] Additionally, it has been published in a peer-reviewed scientific journal.[3]

The EPA IRIS Assessment applied its Guidelines for Carcinogen Risk Assessment (EPA, 2005) to classify EtO as "carcinogenic to humans" by inhalation. This is based on four lines of evidence: (1) epidemiological evidence of lymphohematopoietic cancers and breast cancer in EtO exposed workers, (2) tumors in laboratory animals, including lymphohematopoietic cancers in rats and mice and mammary carcinomas in mice following inhalation exposure, (3) clear evidence that EtO is genotoxic and sufficient weight of evidence to support a mutagenic mode of action for EtO carcinogenicity, and (4) strong evidence that the key precursor events are anticipated to occur in humans and progress to tumors, including evidence of chromosome damage in humans exposed to EtO.[4] Moreover, the IRIS assessment correctly applies an age-dependent adjustment factor (ADAF) based on the assumption of increased early-life susceptibility, which is supported by the determination of a mutagenic mode of action for EtO carcinogenicity.[5]

The EPA National Air Toxics Assessment (NATA) models and methods are likely to underestimate true risk by failing to account for the multiple exposures that are the reality of communities like Cancer Alley Louisiana and other industrial centers around the nation, where facilities across different sectors are in

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[1] EPA IRIS Evaluation of Inhalation Carcinogenicity of Ethylene Oxide. December 2016. EPA/635/R-16/350Fc. Available at https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/1025_summary.pdf#nameddest=cancerinhal

[2] See document history here: https://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance_nmbr=1025

[3] Jinot J, Fritz JM, Vulimiri SV, Keshava N. Carcinogenicity of ethylene oxide: key findings and scientific issues. Toxicol Mech Methods. 2018 Jun;28(5):386-396

[4] EPA IRIS (2016). https://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance_nmbr=1025

[5] EPA IRIS (2016). The ethylene oxide IRIS assessment states the following: "Because the weight of evidence supports a mutagenic mode of action for EtO carcinogenicity, and as there are no chemical-specific data from which to assess early-life susceptibility, increased early-life susceptibility should be assumed, according to the *EPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens—hereinafter referred to as the "EPA's Supplemental Guidance"*. This mode-of-action-based assumption of increased early-life susceptibility supersedes the assumption of age independence under which the human data-based estimates presented above were derived."

close proximity. By continuing to fail to consider the cumulative impacts of exposures to multiple chemicals from different facilities and across industrial sectors, EPA assessments fail to capture the toxic reality of industrial sectors that co-locate in communities that lack political power. Those other sources are also regulated under section 112 of the Clean Air Act, and EPA can and should set stronger emission limits to provide protections that communities have needed for decades.

We are aware that the chemical industry trade association, the American Chemistry Council - states that, "the EO cancer value derived from EPA's modeling is 19,000 times lower than the normal, naturally-created levels of EO in the human body".[6] In fact, the IRIS assessment did not derive such a calculation, and the ACC modeling from which this statement could have been derived can't be confirmed because the calculations and assumptions on which it is based are not described in any of ACC's public statements. ACC's statements should be disregarded.

In Sept 2018 the ACC petitioned EPA for a Request for Correction of the IRIS EtO Assessment, opposing the use of the EtO value in EPA's NATA.[7] The IRIS assessment states that exposure of a population to an EtO air concentration of 0.0002 $\mu g/m^3$ for a lifetime yields an estimated extra cancer risk of up to one in one million. This estimated extra risk is due to exogenous EtO exposure; exogenous means additional EtO above the cellular (endogenous) levels. Thus, this estimated risk is in addition to whatever background cancer risk currently exists in the exposed population. EPA's estimates are designed to be (upper bound) estimates of extra risk (above background). Although the body does produce EtO endogenously, it has defense mechanisms, albeit imperfect ones, to deal with some level of endogenous exposure. Breast cancers and lymphoid cancers are common cancers and it is possible that endogenous EtO may contribute to background levels of those cancers. Given the background levels of these cancers, it is expected that the body's defense mechanisms may be largely overwhelmed by additional exogenous exposures, especially when considered across the whole population.

The bottom line is that the IRIS toxicity and carcinogenicity modeling and approach are reasonably appropriate, though much more likely to underestimate risk than to overestimate it. The basis for ACC's claim is unclear and ACC's methodology has not been made public. Further, ACC's criticism is really immaterial given that the Inhalation Unit Risk estimate provided in the IRIS assessment is the risk above background.

The ACC includes the Ethylene Oxide Panel which is comprised of producers of ethylene oxide that have a financial interest in disregarding the health risks of its products and weakening regulations such as emissions controls. To that end, the ACC and its industry members defensively and seemingly endlessly challenge the existing evidence of harm – often without any new data or information - while dangerous and deadly chemical pollution continues. As the seminal 2009 National Academies report Science and Decisions (the Silver Book) has pointed out in several important reports, it is more likely that the true risk is underestimated due to the failure to routinely capture prenatal exposures, exposure to multiple

[6] ACC. Ethylene Oxide Frequently Asked Questions. Webpage. https://www.americanchemistry.com/EO/Ethylene-Oxide-Frequently-Asked-Questions.html

[7] ACC Request for Correction. Sept 2018. https://www.americanchemistry.com/EO/Request-for-Correction-under-the-Information-Quality-Act-2014-NATA.pdf

chemicals and stressors, exposure from multiple routes including occupational, and other factors that are unaccounted for in many risk assessments (NRC 2009; NRDC 2012).[8]

Not only should EPA apply the most current and best available science to the cancer risk calculation, but it must do so for the acute and chronic noncancer risk estimates as well. EPA recognizes that for the noncancer risk, the estimated target organ specific hazard index (TOSHI) values are well above the Hazard Index of 1, which is the level at which no adverse health effects are expected. The TOSHI largely underestimates risk by calculating the hazard index based on risk driven by a specific organ system as opposed to aggregating risk across all organ systems. The human body does not distinguish risk based on the highest risk driver to a particular organ system – risk is distributed across organ systems with pollutants affecting multiple organs or organ systems at once. For this source category, the allowable noncancer risk is well over the screening for the Hazard Index and is driven by respiratory risks from chlorine emissions. The facility-wide risk is strikingly high and is driven primarily by trichloroethylene (TCE), a volatile organic compound whose acute exposure is known and recognized by EPA to cause defects to the developing fetus. Here, it appears EPA assessed noncancer risk across multiple organ systems. Communities living near these facilities are burdened not only by high cancer risks driven by EtO, but by significant acute and chronic risks driven by chlorine and TCE emissions. While EPA acknowledges that some Hazard Indices "…may have been underestimated…", EPA still finds the risks to be acceptable in this rulemaking.

Environmental racism plays a leading – and deadly – role in where polluting industries are located, how they are concentrated, and whether they are compliant with regulations. This is well documented in all areas of the country, and all countries in the world. For example, researchers at the EPA National Center for Environmental Assessment, building on previous studies, demonstrated that non-whites and below-poverty individuals are more likely to reside near stationary sites of noxious air pollution (PM2.5).[9] The study, Mikati et al (2018), confirms previous results, but also finds that the racial correlation is stronger than the economic one. In other words, siting polluting industrial facilities is both racist and classist, but mostly racist. They found this by using the metric of pounds of pollution instead of number of facilities, further emphasizing the importance of EPA addressing the health risks from cumulative exposure to multiple chemicals. The research also suggests that communities of color are adjacent to the dirtiest facilities in areas with little to no regulatory oversight and enforcement. The 2016 EtO IRIS assessment recognized the importance of the application of the ADAF, which yields a health risk value that is protective of children, especially the most vulnerable children in our country: children who live in low-income communities and communities of color.

The recent investigation of the Sterigenics facility that was emitting EtO at dangerously high levels into the Willowbrook community shows an 80% increase in Hodgkin's lymphoma among women in the area, compared to background.[10] EtO exposures to Cancer Alley communities in Louisiana are hundreds of times higher. See for example the investigative news report published in The Intercept, A Tale of Two Toxic Cities by Sharon Lerner, Feb 2019. Her report shows 109 air pollution hotspots in the US, based on

[8] NRC. 2009. National Research Council. Science and Decisions: Advancing Risk Assessment. Washington, DC: The National Academies Press. https://doi.org/10.17226/12209.

[9] Mikati I, Benson AF, Luben TJ, Sacks JD, Richmond-Bryant J. Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status. Am J Public Health. 2018 Apr;108(4):480-485. doi: 10.2105/AJPH.2017.304297.

[10] Cancer Incidence Assessment near Sterigenics in Willowbrook, IL, 1995-2015. Illinois Department of Public Health Division of Epidemiological Studies. Springfield, Illinois March 29, 2019.
http://www.dph.illinois.gov/sites/default/files/publications/sterigenicswillowbrookcancer-investigation-final.pdf

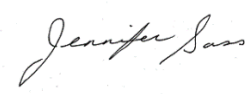
census tract data, where cancer risk estimates exceed the EPA trigger action level of 100 cancers per 1 million people. And, of these, 90 percent of the risks is caused by cumulative exposure to just three air pollutants: ethylene oxide, formaldehyde, and chloroprene. The top 100 air pollution 'hot spot' communities are spread across a number of states, including Louisiana, Pennsylvania, Colorado, West Virginia, Texas, Illinois, and Delaware.[11]

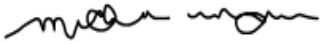
There is considerable evidence for a cumulative adverse impact of toxic pollution for communities where multiple facilities are releasing multiple compounds into the air and water. See for example: Mikati et al (2018) discussed above; the Project TENDR scientific consensus statement on the developmental impacts to children's brain development from air pollution showing links to developmental delays, reduced IQ, and learning disabilities;[12] Payne-Sturges et al (2019) that reported on the link between adverse neurodevelopmental outcomes and air pollution exposure.[13]

In summary, we respectfully ask that:

- Federal and state agencies including EPA use and apply the 2016 EPA IRIS assessment of EtO to evaluate health risks and set health protective regulations and emissions restrictions, instead of ignoring the best available science;
- EPA address and reduce the unacceptable cancer risks suffered by communities due to hydrochloric acid production facilities (including collocated chemical plants and other emission sources under common control).
- EPA reduce the known acute and chronic noncancer risks posed by these sources (including to the respiratory, immunological, kidney, developmental, neurological, reproductive, and liver organ systems), to assure an ample margin of safety to protect public health.

Thank you for your consideration of these comments.





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[11] Lerner, S. A Tale of Two Toxic Cities. The Intercept. Feb 24, 2019. https://theintercept.com/2019/02/24/epa-response-air-pollution-crisis-toxic-racial-divide/

[12] Bennett D, Bellinger DC, Birnbaum LS, Bradman A, Chen A, Cory-Slechta DA, Engel SM, Fallin MD, Halladay A, Hauser R, Hertz-Picciotto I, Kwiatkowski CF, Lanphear BP, Marquez E, Marty M, McPartland J, Newschaffer CJ, Payne-Sturges D, Patisaul HB, Perera FP, Ritz B, Sass J, Schantz SL, Webster TF, Whyatt RM, Woodruff TJ, Zoeller RT, Anderko L, Campbell C, Conry JA, DeNicola N, Gould RM, Hirtz D, Huffling K, Landrigan PJ, Lavin A, Miller M, Mitchell MA, Rubin L, Schettler T, Tran HL, Acosta A, Brody C, Miller E, Miller P, Swanson M, Witherspoon NO; American College of Obstetricians and Gynecologists (ACOG); Child Neurology Society; Endocrine Society; International Neurotoxicology Association; International Society for Children's Health and the Environment; International Society for Environmental Epidemiology; National Council of Asian Pacific Islander Physicians; National Hispanic Medical Association; National Medical Association. Project TENDR: Targeting Environmental Neuro-Developmental Risks The TENDR Consensus Statement. Environ Health Perspect. 2016 Jul 1;124(7):A118-22..

[13] Payne-Sturges DC, Marty MA, Perera F, Miller MD, Swanson M, Ellickson K, Cory-Slechta DA, Ritz B, Balmes J, Anderko L, Talbott EO, Gould R, Hertz-Picciotto I. Healthy Air, Healthy Brains: Advancing Air Pollution Policy to Protect Children's Health. Am J Public Health. 2019 Apr;109(4):550-554. doi:10.2105/AJPH.2018.304902.

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